The Nexus Between The Economy, M&A Transactions and Investors' Behaviour: International Evidence

Vikrant Gandotra

Thesis submitted to the University of Ottawa
in partial Fulfillment of the requirements for the
MSc Management – Finance

Telfer School of Management
University of Ottawa

Acknowledgement

I would like to take this opportunity to sincerely thank everyone who supported me throughout my graduate studies. I am grateful to everyone with whom I've had the pleasure to work with at Telfer.

I would like to express my gratitude to Professor Samir Saadi and Professor François-Éric Racicot, who guided my research and provided me with a solid platform to build on. They steered me in the right direction and their suggestions have been invaluable. Furthermore, I would also like to express my gratitude to Professor Lamia Chourou and Professor Imed Chkir for their constructive feedback and suggestions which helped shape this research.

Finally, I would like to express my profound gratitude to my family. Nobody has been more important to me in the pursuit of my graduate studies than the members of my family. I would like to thank my parents and sister, whose support and guidance are with me in whatever I pursue. This would not have been possible without them.

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Abstract

This research contributes to the much-debated literature existing on the relationship between the economy, merger and acquisitions (M&A), and investors' behaviour by empirically examining the relationship between aggregate M&A transactions, Real GDP and the stock market in the top nine countries with respect to M&A activity globally from the period 1999-2018. Interestingly, according to the cross-sectional dependence and slope heterogeneity tests conducted, the research finds that when a specific country's stock market, Real GDP or M&A activity is affected or influenced in some way, this may also have an affect or influence on the other countries considered in this research as well. Each of the nine countries have some common economic characteristics. Additionally, each country has its system with reference to how the stock market index(s), economic activity and M&A activities influence each other and operate individually. This indicates that an economic relationship between the variables in one country may not be replicated by the others. Furthermore, in a country-by-country causality analysis using the Toda and Yamamoto (1995) approach, the research finds considerable evidence in support of the behavioural school of thought where investors' behaviour and M&A activity seem to influence each other. Out of the nine countries investigated, six countries support the behavioural school of thought, i.e., show strong to moderate causality between M&A activity (number or value) and stock market price index. On the other hand, with reference to the neoclassical theory, surprisingly, there seems to exist a relationship between M&A activity and economic activity where M&A activity (number or value) leads economic activity in two out of the nine countries investigated. Finally, the research also suggests that economic activity seems to have an impact on how investors behave in six out of the nine countries investigated.

Highlights

- The research investigates the relationship between investors' behaviour, M&A activity and economic activity
- Investors' behaviour is measured by the stock market price index(s)
- M&A activity is measured by the total number and total value of deals
- Economic activity is measured by Real GDP
- The research uses quarterly data for nine countries from the period 1999 to 2018
- Six out of the nine countries provide evidence in support of the behavioural explanation
- Surprisingly, two out of the nine countries demonstrate a one-way causality where M&A activity leads economic activity

1. Background & Introduction

The study of Mergers and Acquisitions (M&A's) has been an area of much research and has been one of the most popularly debated topics with reference to the economic and finance community. Merger and Acquisition transactions represented an aggregated volume of $3.89 Trillion in the year 2018[1]. During the last two decades, M&A's have been increasing at record levels. Their substantial magnitude coupled with their ability to create valuable synergies makes M&A's an important research topic to practitioners and academics. M&A's have been quite a debated topic; much research has been poured into demystifying the association between M&A activity and the stock market. Prior literature devotes a considerable amount of effort with reference to understanding the association between economic activity, M&A transactions and the stock market (Rhodes-Kropf and Viswanathan, 2004; Shleifer and Vishny, 2003). The debate on the relationship between economic activity, M&A transactions, and the stock market can be categorized into two primary school of thoughts – The Behavioural approach and the Neoclassical approach. The behavioural explanation suggests that there exists a relationship between aggregate M&A transactions and the stock market where aggregate merger activity occurs due to the changes in the stock market. On the other hand, the neoclassical approach suggests that the overall economic conditions lead to the reaction of firms reallocating their assets through the way of engaging in M&A transactions (Harford, 2005).

This research contributes to this on-going discussion by empirically studying the relationship between aggregate M&A transactions, economic activity, and the capital markets on an international scale. The purpose of this research is not to perfectly predict future stock

[1] Institute for Mergers, Acquisitions and Alliances (IMAA) . (January 14, 2019). Value of mergers and acquisitions (M&A) worldwide from 1985 to 2018 (in billion U.S. dollars). In Statista. Retrieved July 26, 2019, from Statista

market returns, M&A activity or economic conditions in terms of modeling, but rather to determine the usefulness of the specific variables utilized in the study to explain the relationship between aggregate M&A activity, the economy, and the stock market.

M&A's are one of the most popular transaction types for a business to increase its footprint. Martynova & Renneboog (2008) in their seminal work titled *"A Century of Corporate Takeovers: What Have We Learned and Where Do We Stand?"* demonstrated Mergers and Acquisition (M&A's) activity occur in waves. An enormous amount of research has been conducted concerning the timing of M&A activity and its relation to the stock market. A promising amount of literature suggests that there exists a relationship between the stock market and M&As, where misevaluations in the stock market drive M&A activity. However, there has been an exciting development in recent times, practitioners and the popular economic and financial press have publicly speculated that – there may exist an alternative relationship between M&A transactions and the stock market, i.e., M&A activity may stimulate and lead the stock market. According to an article published in the Wall Street Journal, a boom in Japanese M&A activity supported the Nikkei in clearing the 17000 mark in 2006 (Morse, 2006).

Furthermore, in recent times, according to Bloomberg (Philips, 2015), *"A surge in M&A can be a sign the economy is sputtering."* The article states that a rise in M&A activity signals that companies can no longer grow organically. Additionally, the article quotes practitioners such as David Rosenberg (Chief economist at Gluskin Sheff) - *"When companies embark on peak M&A activity, it is more often than not coinciding with a peak in the stock market and, dare I say, a peak in the business cycle. Companies are telling us they can no longer grow organically."* Additionally, an article in Business Insider (Street, 2017) states that M&A activity breached the YTD (Year to date) for the first time since the pre-2007 collapse year. It says that *"Mergers and acquisitions are starting to look a lot like they*

did just before the financial crisis." Similarly, fast forward one year - Massoudi & Khan (2018) state that M&A activity in 2018 has hit a record high[2]. The article goes on to state that major stock indices are also hovering around their all-time highs.

On the other hand, a series of industry reports suggest something more radical than just M&A activities driving the stock market and vice-versa. According to a report by OFI Asset Management (Bouacha, Cretin and Dieudonne, 2014), "*M&A cycles often coincide with rising capital markets and an upturn in economic activity."* The report investigates the drivers of M&A activity and suggests that healthy capital markets and economic activity play an important role in stimulating M&A activity. Another report by Moody's Analytics (Green and Levine, 2018) suggests that stock prices and M&A activity, which have historically been firmly correlated may not be so correlated after all. According to the report, in recent years, specifically, 2016 and 2017, there seems to be a divergence between M&A activities and the stock market. The report suggests that other macroeconomic influences, such as overall economic development and monetary policies, may be the reason for the divergence. It also suggests that due to the economic expansion of the preceding years coupled with an expansion in market valuations, there may not be enough suitable targets left in the market to justify the risk from engaging in M&A activities. Similarly, a report from Deloitte (M&A Team, 2018) suggests that global economic uncertainty, coupled with stock market volatility are major concerns that may influence aggregate M&A activity. The report also points towards policy uncertainty, such as legal regulations and taxation that may impact M&A activity. Additionally, a report by J.PMorgan Chase and Co. (M&A Team, 2018) suggests that economic growth and capital markets play an important role in providing companies with the confidence to pursue M&A transactions. It also points towards an observed slowdown in

[2] Another article that claims M&A boom's lead the stock market - *M&A frenzy stokes fear of market nearing top of cycle*

2016 and 2017 with reference to M&A activities possibly caused by regulatory reforms such as the U.S. tax reform and the ongoing Brexit dilemma.

There seems to be the existence of a pattern in all of the above-reviewed reports. Some of the reports suggest that during 2016 and 2017 where the stock market(s) continued to rise, M&A activity seemed to decline. Furthermore, all of the reports suggest that macroeconomic concerns may be an important influencing factor impacting M&A activity. Hence, an important issue in this context is to study the relationship/association between transactions such as M&A's, economic activity, and the stock market. The findings may enable policymakers, investors, and academics to understand the response that the overall economy or the market may develop with reference to the characteristics of M&A transactions (and vice-versa).

The research examines the two-way relationship between M&A activity, economic activity and the stock market from 1999 till 2018 in the top 9 countries with reference to market share in global M&A activity. The various stock market price index(s), Real GDP, and aggregate M&A activity are used to quantify the relationship between aggregate M&A activity, economic activity and the stock market.

More specifically, the research contributes to the literature in three ways - The first seeks to identify the causal (Granger Causality) relationship between the stock market price index, economic activity, and aggregate M&A transactions; second, by examining the two-way relationship between aggregate M&A transactions, economic activity, and the stock market, the research extends the prior literature by examining the feedback relationship from each of the variables utilized; third, since the measures and the data utilized are somewhat universal, i.e., transactions are taken from all over the world, representing all industries over a period of 19 years, the findings of this study are not restricted to a specific country or industry.

Interestingly, the research finds strong presence of cross-sectional dependence among the nine countries investigated, i.e., error terms in different countries are mutually influenced. This suggests that, when a specific country's stock market, economic activity or M&A activity is affected or influenced in some way, this also has an effect or influence on the other countries as well. Each of the nine countries have some common economic characteristics. It can be said that these influences affect the variables in the same way in other countries as well. Additionally, the results of the slope heterogeneity test also reject the null hypothesis, suggesting each country has its system with reference to how stock market index, Real GDP and M&A activities influence each other, i.e., an economic relationship between the variables in one country may not be replicated by the others. It can be said that the relationships between M&A activities, stock market index and Real GDP in these countries show some considerable differences. Hence, due to the presence of heterogeneity, the research conducts a country-by-country causality analysis rather than applying a stacked causality analysis which assumes homogeneity and assumes that all coefficients are same across all cross-sections.

Out of the nine countries investigated, six countries support the behavioural school of thought, i.e., they show strong to moderate causality between M&A activity (number or value) and the stock market price index. On the other hand, with reference to the neoclassical theory, surprisingly, there seems to exist a relationship between M&A activity and economic activity where M&A activity (number or value) leads economic activity in two out of the nine countries investigated.

The rest of the paper is organized as follows – Section(2) identifies the various contributions made by previous research and discusses the behavioural and neoclassical school of thought; Section(3) develops the framework of the current research; Section(4) describes the data; Section(5) outlines the methodology and presents the results of the analysis conducted to reveal the nature of the time-series variables; Section(6) discusses the

empirical findings of the research; Section(7) presents the results of secondary analysis and robustness checks; Section(8) discusses some limitations followed by the conclusion in Section(9).

2. Literature Review

This section identifies the various contributions made by earlier researchers through an extensive review of the literature and compares the behavioural approach with the neoclassical approach.

According to Fama (1970; 1981;1990), the stock market is considered to be a useful tool for reflecting the state of an economy and market behaviour. Previous research indicates that macroeconomic variables (such as GDP and Interest Rates) are considered to carry vital information concerning the stock market and consequently, the future state of an economy. M&A's, on the other hand, have been a debated topic, and several researchers have noted the association between M&A activity and the stock market. However, previous literature is somewhat inconclusive concerning the impact of M&A transactions on the stock market. This research provides empirical evidence on the association between M&A transactions, Real GDP, and the stock market using international data.

M&As have been subject to economic and financial research for decades. Empirical research on M&A activity has revealed a great deal about M&A trends and characteristics over the past few decades. According to Martynova and Rennebog (2008: 2148), *"it is a well-known fact that mergers and acquisitions (M&As) come in waves."* Similarly, supporting Martynova and Rennebog's (2008) claim, many researchers accept the wave hypothesis (Brealey and Myers, 2010). According to Martynova and Rennebog (2008), each merger wave coincides with some economic and regulatory changes. However, when talking about the relationship between M&A activity, economic and regulatory changes, a vast amount of

literature exists on the empirical examination of the relationship between the stock market, merger transactions, and other economic variables. The literature can be broadly categorized into - The Behavioural explanation and the Neoclassical explanation.

The table given below organizes all of the literature reviewed[3], categorized on the bases of the variables used and the level of analysis.

Table 2.1 - Literature Review

Research	Level	Dependent Variable	Independent Variable
Nelson (1959), Gort (1969), Verter (2002), Dong et al. (2006), Ang & Cheng (2006), Shleifer & Vishny (2003), Rhodes-Kropf & Viswanathan (2004)	Stock Market-Level	Number of Deals/Deals Frequency and Deal Value	Stock price, Volatility of the stock market, Stock market behavior
Melicher et al. (1983), Becketti (1986), Clark et al. (1988), Mulherin & Boone (2000), Jovanovic & Rousseau (2002), Harford (2005), Kummer (2006), Doytch & Cakan (2011), Nakamura (2004), Resende (2008)	Macroeconomic-Level	Number of Deals/Deals Frequency and Deal Value	GNP, GDP, Interest rate, The economic cycle, Stock Market
Mitchell & Mulherin (1996), Schlingemann et al. (2002), Harford (2005), Miyazaki (2009)	Industry-Level	Number of Deals/Deals Frequency and Deal Value	Economic, Technological and Regulatory shocks, Capital liquidity, Research and Development

[3] Although all attempts have been made to be as thorough as possible concerning the literature review, it should not be considered exhaustive

Jensen (1986), Harford (1999), Jovanovic & Rousseau (2002), Shleifer and Vishny (2003), Granier (2008)	Individual Firm-Level	Number of Deals/Deals Frequency and Deal Value	Free cash flow, Cash reserve, Firm's heterogeneity, Firm performance, Tobin's Q
Geroski (1984), Sharma & Mathur (1989), Clarke & Ioannidis (1996), Clark et al. (1988), Bogdan et al. (2010), Bennett & Dam (2018), Hsueh et al. (2014)	Stock Market-Level	Stock Market	Number of Deals/Deals Frequency and Deal Value, GDP, Merger Premiums

2.1 The Behavioural & Neoclassical Approach

The idea of the stock market and its relationship to M&A activity is not new; the behavioural explanations for the relationship between M&A and stock market can be traced back to Nelson (1959). Nelson (1959) employed a simple regression analysis using US quarterly data for the period 1895-1920 and noted that merger activity seems to rise and increase when stock prices are high. Similarly, Gort (1969) also suggests that there is a positive correlation, i.e., stock market prices can drive a merger trend and bring in high periods of merger activity. Furthermore, Verter (2002) compares merger activity to the volatility of the stock market in the US and finds a significant correlation between the two. Verter (2002), suggests that there is a strong positive correlation specifically concerning M&A deals involving all-stock payment methods. Verter (2002) interprets this as evidence of market timing, i.e., managers often try to time the market by paying with stock when they believe that their stock is overvalued. Similarly, a number of other researchers have recognized this interpretation as put forward by Verter (2002). Shleifer & Vishny (2003) focusing on U.S. data, suggest that over-valued firms tend to utilize stock as a method of payment in order to obtain their target

at a discount. Their model rests on the parameters of relative valuations of the merging firms and the market's perception of the synergies from the combination. Shleifer and Vishny's (2003) model suggests that managers of target firms with short time horizons for decision making accept the bidder's temporarily overvalued equity. They suggest that overvaluation on the aggregate market level or in specific industries would lead to a wave-like formation of M&As activity over time.

Following a somewhat similar pattern, Rhodes-Kropf and Vishwanathan (2004) focusing on U.S. data, develop a model that suggests misevaluations in the stock market drive merger activity. They develop a model based on rational managerial behaviour and uncertainty about sources of misevaluation. Their model also leads to a correlation between market performance and merger waves. Their research suggests that managers are not always able to distinguish between firm-specific and market-wide valuation errors that lead them to accept offers from overvalued acquirers. These errors may be attributed to information asymmetry, i.e., due to information asymmetry, the acquiring firm may have more information about their valuation which the target firm may not have, leading the target firm to accept the offer from the overvalued acquirer. Additionally, Ang & Cheng (2006) and Dong et al. (2006) using domestic M&A transactions in the US (During 1981-2007; 1978-2000 respectively), support the misevaluation theory by empirically analyzing bidder and target valuations. Their research provides empirical evidence of the fact that share overvaluation is an essential motive for firms to engage in merger activities.

On the other hand, the neoclassical explanation associated with merger activity focuses on the impact of economic and industry shocks — Mitchell & Mulherin (1996) in their research study industry-level patterns in merger activity. Their research focuses on US data during the period 1982-1989 and spans across 51 different industries. Mitchell & Mulherin (1996) argue that various technological and regulatory shocks from different

industry levels drive merger activity. Similarly, Harford (2005) supporting the neoclassical explanation suggests that aggregate merger activity occurs in response to specific economic and industry shocks. However, the research also indicates that these shocks are not enough to cause large scale asset relocation, such as M&A transactions. The occurrence of large scale merger activity also depends on capital liquidity; it should be enough to accommodate a merger transaction.

Harford (2005) unlike Mitchell & Mulherin (1996) suggests that merger activity requires an economic motive and furthermore, merger activity also requires liquidity and relatively low transaction costs to generate a large volume of transactions. Harford's (2005) research can be said to be a more comprehensive and explanatory approach than the one used by Schlingemann, Stulz, & Walkling (2002). Schlingemann, Stulz, & Walkling (2002), in their research, focus on firm divestitures. They suggest that asset liquidity plays a vital role in determining which assets will be divested. Their research offers a slight modification to the neoclassical hypothesis and suggests that capital liquidity is a critical factor to consider and only when sufficient liquidity exists to accommodate the reallocation of assets, will an industry shock drive merger activity. Furthermore, Miyazaki's (2009) research on the relation between Research & Development activity (R&D) and M&A transactions in high-tech industries suggests that there exists a positive correlation between R&D investment and M&A activity in Japan. Their research suggests that firms expect to obtain synergy effects of the high amount of R&D investment by actively engaging in M&A transactions.

Comparing the various behavioural and neoclassical explanations, we can observe that the behavioural explanation suggests that there exists a relationship between aggregate merger activity and the stock market where mergers activity occurs due to misevaluations in the stock market while the neoclassical approach suggests that an industry-wide technological, or economic stimulus leads to the reaction of firms reallocating their assets through the

way of engaging in M&A transactions. Furthermore, researchers also argue that industry shocks may not be enough to drive merger activity; favourable economic conditions and capital liquidity is also of critical importance. However, another popular approach that also falls into the neoclassical school of thought focuses on individual firm-level analysis and offers a somewhat different perspective.

Jensen (1986) proposes a theory of free cash flows with an emphasis on eliminating agency costs through takeovers. The research applies the agency theory to the conflict over the situation of a firm having excess free cash flow. The theory suggests that the availability of significant cash flows and cash reserves encourage managers to engage in M&A activity. Jensen (1986) focusing on US data suggests that target firms can be mainly categorized into two types – firms with poor management that have not performed well financially before the merger and firms that have performed exceptionally and have an abundant cash flow which they refuse to pay out to the shareholders as dividends. Jensen (1986) suggests that since excessive cash reserves are essentially stockpiled free cash flow, this agency cost of free cash flow is severe in cash-rich firms. The theory states that takeovers are a response to the malfunctioning of the internal control processes in target firms with cash flow and organisational policies that lead to wastage of resources. The theory places specific emphasis on hostile takeovers, increase in leverage, and also suggests that current managers object to such takeovers due to the fear of losing their jobs and the changes in organisational policies forced on them by a hostile takeover.

The cash flow theory predicts that M&A's financed with cash and debt will generate more benefits as compared to M&A's financed with an exchange of stock. However, this proposition as set forth by Jensen (1986) is somewhat contradictory to the behavioural explanation as proposed by researchers such as Verter (2002), Shleifer and Vishny's (2003) and Rhodes-Kropf and Vishwanathan (2004). Jensen (1986) put forth a theory that M&A

transactions financed by cash and debt would generate more benefits as compared to a transaction financed by stock. However, the behavioural explanation argues that share overvaluation is an essential motive for firms to engage in merger activities. Managers often try to time the market by paying with stock when they believe that their stock is overvalued. Over-valued firms tend to utilize stock as a method of payment in order to obtain their target at a discount.

Similarly, Harford (1999), suggests that cash-rich firms are more likely to engage in M&A transactions. Supporting Jensen's (1986) theory, Harford (1999) suggests that the agency conflict is quite evident in the presence of large free cash. According to Harford (1999) and Jensen (1986), equity holders prefer that - cash above the optimal level of reserves be paid out in the form of dividends. However, managers perceive this as an opportunity to engage in M&A activity, which is a primary method by which managers can spend the excess cash instead of paying it out to their shareholders. Harford (1999) focusing on US data during the period 1950-1994 suggests that acquisitions by cash-rich firms are value decreasing which is reflected in the negative stock price reaction to the announcement and the subsequent poor operating performance of the combined firm.

Jovanovic & Rousseau (2002) following Jensen and Harford's suggestions, provide a somewhat similar explanation that satisfies the Q-Theory[4] of mergers. Jovanovic & Rousseau (2002) argue that a firm's investment rate should rise with its Q, i.e., a firms investment rate should rise as the ratio of its market value to the replacement cost of capital rises. Their research supports the neoclassical theories as put forth by Jensen (1986) and Harford (1999). Although, the theory of free cash flow is also somewhat supported by the behavioural explanation of mergers, i.e., Shleifer and Vishny (2003) identify that a positive merger trend is caused by a high level of cash flow and a low level of financial constraint, the cash flow

[4] Refer to Jovanovic & Rousseau (2002) for an in-depth discussion on the Q-Theory of Mergers

theory does not provide us with the most robust explanation and at best can only be considered as a part explanation. Jovanovic & Rousseau (2002) suggest that the free cash flow theory only explains a small fraction of the whole story. Their model also suggests that mergers are a channel through which capital can flow to better projects and better management. Jovanovic & Rousseau (2002) emphasize the fact that mergers more often than not are used as channels through which capital can flow to better projects and better management.

On the other hand, Granier (2008) presents an interesting game theoretical perspective on the incentives of firms to engage in M&A activity. The research presents static and dynamic acquisition games in which the owners' of the most efficient firm attempts to buy the other firms. The model suggests that as firms' heterogeneity increases the incentives to merge increase as well. Granier (2008) suggests that the best method to value incentives for engaging in M&A activity is to make endogenous merger decisions. The research suggests a model in which the owners decisions are taken into account, and the model only focuses on cases where merger leads to monopolization. The research by introducing a large enough cost heterogeneity suggests that monopolization is feasible for all industry sizes. Furthermore, monopolization is more comfortable if the game is a dynamic one and especially if the discount factor is high. The research suggests that M&A activity is not just concentrated within a specific industry; cross-industry mergers are also beneficial. Although the research lacks empirical support, it is nowadays quite common to see cross-industry mergers such as e-commerce giant Amazon buying the grocery chain Whole Foods and the transaction involving telecom giant AT&T and Time Warner.

Expanding on the discussion concerning M&A activity and the stock market, several researchers suggest that macroeconomic factors may be the critical piece of the puzzle that could provide a complete explanation of this complex relationship. Melicher, Ledolter, & D'Antonio's (1983) research on the time series analysis of aggregate M&A activity can be

said to be a landmark study. Their research offers quite a different perspective from the literature discussed so far. They suggest that that aggregate merger activity may reflect both changes in economic conditions and changes in the capital markets. Their model includes changes in aggregate merger activity, economic growth, and stock prices. Focusing on US data during the period 1947-1977, Melicher, Ledolter, & D'Antonio, (1983) develop a multiple time series model and find a weak correlation between merger activity and economic conditions; however, they find a strong correlation between merger activity and the stock market during the period. Their research indicates that changes in capital market conditions and changes in merger activity have a significant correlation. On the other hand, Becketti (1986), studies the effects of macroeconomic factors on merger activity and suggests that there may be an alternative relationship, i.e., merger activity may have an impact on changes in macroeconomic factors in the US. The research suggests that about a third of the variation in aggregate merger activity (during 1946-1985) can be attributed to the changes in macroeconomic conditions (such as a change in Real GDP). However, they do not find evidence in support of the alternative explanation, i.e., merger activity does not seem to lead the changes in macroeconomic factors.

Similarly, in a series of correlation studies, Kummer (2006) focusing on M&A transactions in the pharmaceutical industry in South America during the period 1851-2003, suggests that the number of M&A transactions correlates with the development and size of an economy measured by the GDP. The study compares the results so obtained with other regions such as Europe and North America and concludes that there exists a relationship between M&A activity and GDP where M&A activity positively influences the development and size of an economy on an international scale.

On the other hand, Doytch & Cakan (2011) in their sectoral study of M&A transactions in OECD countries, suggest that cross-border M&A transactions lead to a slowdown in

the domestic economy. Their research focuses on the primary, manufacturing, and services sector. Doytch & Cakan (2011), in their study, do not find any supporting evidence of the fact that M&A activity contributes to economic growth, the exception being the services sector. Their research suggests that M&A transactions in the services sector do, indeed seem to have a positive effect on growth. Additionally, Nakamura (2004) analyzed the influence of GDP on M&A in the Japanese context (during 1988-2002) and suggests that GDP can be an important factor in explaining short-term M&A activity. Similarly, Resende (2008) analyzed the influence of variables such as stock market returns, real output growth, and real growth of money supply on M&A activity in the UK (during 1969-2004). Their study suggests that the variables as mentioned above, indeed seem to play a role in explaining M&A activity[5].

Following a similar pattern, Clark, Chakrabarti, & Chiang (1988) develop a causal model using the Granger causality method to study the relationship between merger activity, industrial activity, and stock prices in the US during the period 1919-1979. Their research suggests a significant contemporaneous relationship between merger activity and the stock market. Their model indicates that there exists a relationship where stock price movements create conditions for merger activity and furthermore; the model also suggests that an increase in merger activity provides added impetus to a rising stock market. In terms of the relationship between merger activity and industrial activity, the model indicates that a rise in merger activities leads to a decrease in real output; however, there does not appear to be a feedback relationship between industrial activity and merger activity, i.e., a change in industrial activity does not affect merger activity. On the other hand, Mulherin & Boone's (2000) research presents us with a stark contrast. Their findings are contradictory when compared to Clark, Chakrabarti, & Chiang's (1988) research. Mulherin & Boone's (2000) research suggests significant industry clustering in merger activity during the 1990s (1990-

[5] However, they do state that the effects are asymmetric across different periods of activity and somewhat limited.

1999). They suggest that industries undergoing shocks, such as changes in regulations experience a cluster of merger activity. Their findings indicate that there exists a clustering of merger activity, which is determined by various technological, economic, and regulatory shocks in specific industries.

Similarly, Harford's (2005) research supports the above claim. Harford's (2005) research focusing on examining the two school of thoughts: the neoclassical and the behavioural, finds empirical evidence supporting the neoclassical explanation, i.e., aggregate merger waves occur as a result of the clustering of shock-driven industry merger waves and not by attempts to time the market.

In recent times several researchers have attempted to explore and demystify the complex relationship between aggregate M&A activity and the stock market through using a causality model. One such example is the research conducted by Hsueh, Tsao, Tu, Chiu, & Liu, (2014). Their research focusing on data from six OECD countries during the period 1980-2014 develops a Granger causality model and tests for causality among M&A activities, economic growth, and stock prices. The model indicates that there appears to be a significant one-way relationship from stock prices to M&A activities in all the surveyed countries except Australia, i.e., changes in stock prices lead M&A activity in five out of the six countries. Concerning the impact of economic growth on M&A activities, the model suggests that when the change in stock prices is used as the control variable, there is no significant relationship between economic growth and M&A activities, except for in Japan.

Furthermore, the use of Granger causality analysis for studying the relationship between M&A activity and the stock market can be traced back to Geroski (1984). Geroski (1984) focusing on U.S. and U.K. (individually) data during different periods denies the existence of any correlation existing between merger activity and stock prices. The research suggests that *"There is clearly very little reason to think that the correlation between*

aggregate merger activity and share prices can be used to predict booms and slumps in one series with information from the other" (Geroski, 1984:231). On the other hand, Sharma & Mathur (1989) employing the same methodology on U.S. data during the period 1970-1987 found a strong one-way causality from stock prices to merger activity. Similarly, Clarke & Ioannidis (1996) focusing on U.K. data during the period 1969-1994 study the relationship between aggregate merger activity and the stock market where the stock index is deflated by the gross domestic product (GDP). Their model supports the hypothesis that the stock market leads merger activity in the U.K. The evidence presented in their research is in contrast with the work done by Geroski (1984), who found no evidence of the correlation existing between the two. Furthermore, Clarke & Ioannidis (1996) also conducted a test for the weak form of stock market efficiency, i.e., to test whether merger activity leads the stock market and failed to find strong evidence suggesting that merger activity leads the stock market in the UK during the period 1971-1993.

Following a similar pattern, Bogdan, Laura-Gabriela, and Irina-Eugenia (2010) focusing on Romanian data during the period 2000-2009 develop a causality model to study the relationship between aggregate merger activity and the stock market. Their results are partially consistent with that of Clarke and Ioannidis (1996) and Sharma and Mathur (1989). They suggest that the stock market leads the number of M&A transactions.

Similarly, Bennett and Dam (2018) focusing on US data during the period 1990-2015 claim that changes in merger activity appear to affect stock prices. Their research suggests that as changes to aggregate merger activities are persistent, an increase in merger activity positively affects the stock market and the aggregate level of the stock market rationally rises in anticipation of high deal activity.

To summarize the literature discussed so far, although the two explanations, i.e., the behavioural and the neoclassical explanation offer some valuable insight into the relationship

between M&A transactions and the capital markets. This research adds to the body of knowledge by examining the association between various stock market price indices, Real GDP, and aggregate M&A transactions. An essential issue in this context is to empirically study the relationship between aggregate M&A activity, economic activity, and the stock market on an international scale. A conclusive set of findings on this would be useful for policymakers, investors, and academics. The findings may enable policymakers, investors, and scholars to understand the response that the overall economy and market develops with reference to the M&A transactions (and vice-versa).

The next section discusses the predicted outcomes and the measurements used in the research, followed by a discussion on the variables and the methodology for the study.

3. M&A Transactions, Economic Activity, and the Stock Market

Based on the literature reviewed, the two explanations, i.e., the behavioural and the neoclassical explanation, offer some valuable insight into the relationship between M&A transactions and the capital markets. From the discussion presented, we can observe that the behavioural explanation suggests that there appears to be a strong correlation between M&A activity and the stock market where the stock market leads M&A activity, and in some cases, M&A activity leads the stock market. On the other hand, the neoclassical approach suggests that industry-wide shocks or specific economic conditions leads to the reaction of firms reallocating their assets through the way of engaging in M&A transactions. Furthermore, according to the industry reports reviewed in this research, a unique pattern can be identified. The reports suggest that during 2016 and 2017, where the stock market continued to rise, M&A activity seemed to decline. Additionally, the reports pointed towards macroeconomic conditions being an important influencing factor impacting M&A activity. Hence, an essential issue in

this context is to study the relationship/association between transactions such as M&A's, economic activity, and the stock market.

We can observe that there is some degree of inconclusiveness concerning the studies discussed above. This may be attributed to the different periods under investigation as different periods are characterized by different characteristics of M&A transactions, economic conditions as well as different capital market conditions. Furthermore, a pattern can be observed from the studies discussed so far, a majority of the studies are focused on U.S. data, only a minority of the researchers consider using international data which could have made their findings more generalizable on a global scale. An international study would enable the research to evaluate a more complicated and explanatory relationship, which would make the findings more generalizable. Moreover, most of the studies use M&A transactions as endogenous and study the one-way relationship between M&A transactions, economic activity, and the stock market. This research examines M&A transactions, economic activity, and the stock market by studying the two-way relationship that each variable may have with one another, i.e., it also explores the feedback relationship from each of the variables.

Additionally, no satisfactory or evaluative theory would argue that the complex relationship between M&A transactions, capital markets, and economic factors is entirely in one direction and can be sufficiently explained by individual firm-level analysis (Chen, Roll, & Ross, 1986; Geske & Roll, 1983). The stock market is usually considered as responding to external forces; however, it may also have a feedback on the other variables. It can be said that all economic variables are endogenous in some sense. However, to develop an econometric model on all of the factors is well beyond the scope of this study.

The stock market is usually considered as responding to external forces; these external forces may be attributed to certain macroeconomic factors. Based on prior literature and the literature reviewed in this research (Balvers, Cosimano, & Mcdonald, 1990;

Bernanke & Kuttner, 2005; Campbell, 1987; (Chen, Roll, & Ross, 1986; Gupta & Modise, 2013; Mookerjee & Yu, 1997), this research focuses on macroeconomic activity by using Real GDP as a proxy.

This research explores the two-way relationship between the stock market price index, aggregate M&A transactions, and Real GDP. The aim of the research is not to perfectly predict future stock market returns, economic activity or M&A activity in terms of modeling, but rather to determine the usefulness of the specific variables utilized in the study to explain the relationship between economic growth, M&A activity and the stock market.

Based on previous literature there does seem to be a relationship between M&A transactions, economic activity, and the stock market, however as mentioned, majority of the researchers take M&A transactions to be endogenous and attempt to explain the variation in M&A transactions using the stock market and controlling for certain macroeconomic variables. The current research offers a fresh perspective and contributes to the literature in three ways - The first seeks to explain the causality between the stock market price index, Real GDP and aggregate M&A activity; second, by examining the two-way relationship between the variables of interest, the proposed research extends the prior literature by examining the feedback relationship that these variables may have on one another; third, since the measures and the data that would be utilized are somewhat universal, i.e., transactions would be taken from nine countries, representing all industries over a period of 19 years, the findings of this study are not restricted to a specific country or industry.

In the spirit of the past research, the current research measures aggregate M&A activity by using two different indicators – Total number of completed M&A and Total Transaction value of M&A. The rationale for employing two alternative measures of aggregate M&A activity, i.e., the number of deals and value is to investigate whether or not different measures of M&A activity carry different information about the relationship between M&A activity

and the stock market. The primary criteria to consider when evaluating measurement techniques are - reliability and validity (Zikmund, Babin, Carr, & Griffin, 2012). Consistency is the key to establishing reliability, whereas validity refers to the accuracy of the measure. Good measures are both consistent and accurate. In the context of this research, using - Total number of M&A and Total value of M&A as measures would ensure that both dimensions, i.e., the total quantitative number and the total quantitative value is taken into consideration while conducting the analysis. For example - one $1-million-deal and one $100-million-deal cannot be equivalent in terms of economic value and impact. Therefore, it is imperative to consider both – change in transaction value and change in deal frequency. Furthermore, in line with past research, the stock market is measured by using stock market price index of the different stock indices of the various countries over the specified period, and economic activity is measured by using Real GDP as a proxy.

The research predicts that as changes to economic activity, aggregate merger activities, and the stock market are persistent and on-going, hence, there may exist a relationship between M&A transactions, Real GDP and the stock market where each of the variables has a significant influence on one another in the nine countries considered in this research. The above predictions can be presented in the form of the following hypothesis(s) –

H_1 – *Number of M&A transactions affects the stock market price index*

H_2 – *Value of M&A transactions affects the stock market price index*

H_3 – *Stock market price index affects the Number of M&A transactions*

H_4 – *Stock market price index affects the Value of M&A transactions*

H_5 – *Number of M&A transactions affects Real GDP*

H_6 – *Value of M&A transactions affects Real GDP*

H_7 – *Real GDP affects the Number of M&A transactions*

H_8 – *Real GDP affects the Value of M&A transactions*

The panel data approach leads to different options for testing causality, i.e., test for each cross-section individually or pooled cross-unit tests for causality. In the case of the present research, in order to analyze and capture the relationship between the variables of interest, this research adopts the Toda and Yamamoto (1995)[6] procedure and tests for causality individually for each country due to the strong presence of heterogeneity.

Although a panel data causality test is put forth by Dumitrescu and Hurlin (2012; 2008), allows for heterogeneity among different panel members, it does not consider the situation where cross-sectional dependence may exist among the different panel members[7]. Furthermore, the rejection of the null hypothesis of non-causality in panel tests does not provide any information with reference to the number or the identity of the panel members for which the null hypothesis of no-causality is rejected. Hence, an individual country-by-country analysis using the T-Y (Toda and Yamamoto, 1995) approach seems to be appropriate for this research.

The next section introduces the various data sources, sampling methodology, and variables followed by the methodology.

4. Data

This research uses inferential statistics to establish the predictive power of the independent variables. The rationale behind adopting the inferential approach is to form a database from which certain conclusions can be drawn concerning the target population. Secondary data sources are used for data collection. The data for aggregate M&A activity is extracted from the Thomson Reuters SDC platform, and the data for the various stock indices and Real GDP

[6] Refer to Section 5.4 for a detailed explanation
[7] A bootstrapping methodology has been suggested by Dumitrescu and Hurlin (2012; 2008) for panel data; however, the present research opts for a country-by-country analysis

(seasonally adjusted) is extracted from Thomson Reuters DataStream. The data is aggregated into quarterly observations from the year 1999 till 2018[8].

The following parameters are put in place as filters for M&A activity:

1. The information on acquirers or targets must be complete, i.e., headquarter location is available.
2. The acquirer and target are publicly listed.
3. Only completed transactions are considered.
4. The transactions are announced between January 1999 and December 2018.
5. The minimum deal value is USD 1 million.
6. Only pure merger and acquisitions are considered, the sample excludes exchange offers, leveraged buyouts, privatizations, recapitalizations, repurchases, spinoffs, self-tenders, acquisitions of remaining interest, transactions for which deal value is not disclosed, rumoured deals, acquirers seeking an unspecified target, or targets seeking an unspecified buyer.
7. The final sample consists of top nine[9] countries with respect to their market shares in global M&A activity.

The research utilizes the data obtained after screening through the above parameters to measure aggregate M&A activity. The data on M&A activity, economic activity, and the various stock indices are aggregated into quarterly observations and are transformed into natural logarithms before performing the economic analysis.

The sampling methodology adopted for this research can be referred to as a multistage design since it involves obtaining samples in stages using smaller and smaller sampling units at each stage. This is a further development of the idea of cluster sampling (Fischer, Boone & Neumann, 2014). This technique is appropriate for big inquiries extending to a considerably

[8] This specific time period is chosen due to data constraints and comparability with earlier studies
[9] The top nine countries are chosen due to data constraints, specifically due to insufficient data points concerning M&A transactions

large geographical area. The rationale for adopting this specific design is that it helps to reduce the potential for human bias within the information collected. It also simplifies the information assembly process, reducing the risks of negative influences caused by random variations (Fischer, Boone & Neumann, 2014). In terms of representativeness and generalizability, if carried out accurately, the sampling would yield generalizable estimates of the target population (Fischer, Boone & Neumann, 2014). Table 4.1 describes the variables of interest.

Table 4.2 – Variables and Measurement

Variables	Description/Measurement	Data Source
Stock Market Price Index (SPI)	Measured by the natural logarithm of stock market price index (LSPI) on a quarterly basis	Thomson Reuters DataStream
Aggregate Number of M&A Transactions (NT)	Measured by the natural logarithm of Aggregate number of M&A transactions (LNT) on a quarterly basis	Thomson Reuters SDC
Aggregate Value of M&A Transactions (VT)	Measured by the natural logarithm of Dollar value of M&A transactions (LVT) on a quarterly basis	Thomson Reuters SDC
Real GDP (RGDP)	Measured by the natural logarithm of Real GDP (LRGDP) on a quarterly basis	Thomson Reuters DataStream

Table 4.2 depicts the descriptive statistics of the raw data obtained from the various data sources before any transformations. We can observe that the mean number of transactions for all countries is approximately 13, while the median is 7. Furthermore, the mean value of

transactions is approximately $16,626 (millions USD) while the median is approximately $3,583 (millions USD) which implies a skewness in the distribution.

Table 4.3 – Descriptive Statistics

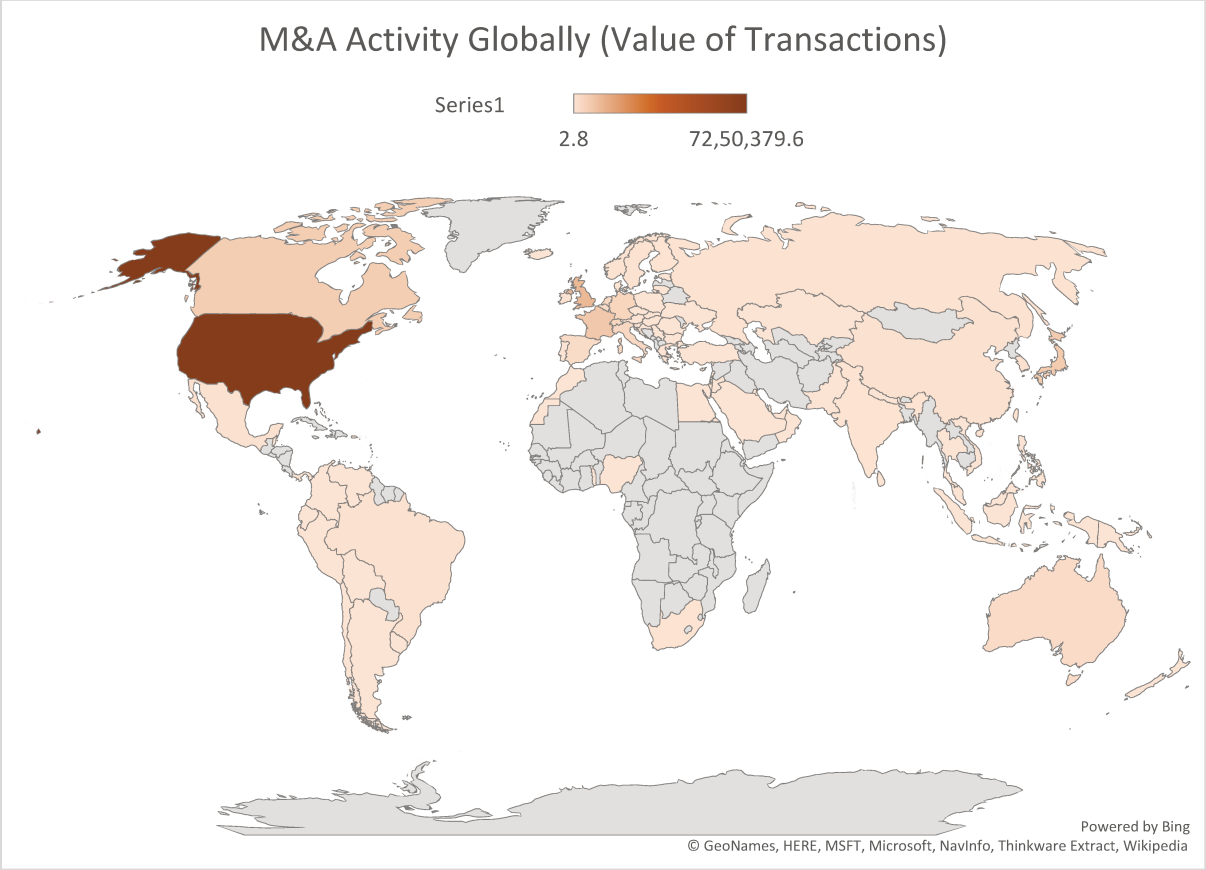
	NT	SPI	RGDP	VT
Mean	13.32361	8877.907	2227214	16626.12
Median	7.000000	5983.390	593096.0	3583.132
Maximum	140.0000	46728.95	18765256	350733.2
Minimum	0.000000	811.0800	73672.00	0.000000
Std. Dev.	18.69288	8218.209	4741399	35958.01
Observations	720	720	720	720

SPI denotes the stock market price index, RGDP denotes Real GDP, NT denotes the number of M&A transactions, VT denotes the value of M&A transactions.

Additionally, with reference to the Real GDP, the mean is approximately $2,227,214 (millions USD) while the median is approximately $593,096 (millions USD), which again implies a skewness in distribution.

The research also presents a heat-map (Map 4.3), which represents M&A activity globally based on the total value of transactions during the period 1999-2018.

Figure 4.4 – Heat Map



It can be observed that the United States accounts for the majority of the deal-making activity globally in terms of number and value of deals and makes up 51.5% of the total M&A activity (Table 4.4). The United Kingdom is the second most active deal-making nation with a 7.9% market share followed by France, Japan, Canada, Germany, Switzerland, Italy, and Australia[10].

Although Japan and Canada represent a 5.0% and 4.5% share globally (respectively), occupying the fourth and fifth position in the league table, it is interesting to see the high frequency of deals being made in these countries. The frequency of deals in these two countries surpasses the United Kingdom and France which occupy the second and third place (respectively); however, with reference to the value of deals, Japan and Canada trail by a

[10] Netherlands is replaced by Australia in the league table due to insufficient data points with reference to M&A transactions. According to SDC, Netherlands is the ninth most active deal maker.

considerable margin. Hence, It is imperative to look at both dimensions when measuring M&A activity, i.e., the number of deals and the total value of deals as both of these measurements carry different information with reference to aggregate M&A activity.

Table 4.5 – Top 9 Countries with reference to M&A Activity Globally (SDC)

Nation	Deal Value ($ Mill)	Market Share	Number of Deals
United States of America	72,50,379.6	51.5	4,358
United Kingdom	11,16,456.9	7.9	775
France	7,73,442.4	5.5	416
Japan	7,09,249.4	5.0	1,467
Canada	6,35,635.7	4.5	1,418
Germany	4,32,325.3	3.1	219
Switzerland	3,63,025.7	2.6	145
Italy	3,40,541.4	2.4	147
Australia	2,56,781.6	1.8	603

5.0 Methodology

As with any research that aims to study the effect/impact/association between economic and financial variables, endogeneity can be a real problem which may question the overall validity of the findings. Endogeneity in its most basic form, can be caused by omitted variables or unobserved heterogeneity. In order for this research to draw correct and valuable economic inferences, a battery of pre-tests for detecting heterogeneity and cross-sectional dependence are conducted which would enable the research to utilize the most appropriate econometric tools and at the same time ensure the stability of the diagnosis.

Since the data consists of nine different countries from around the world, there is bound to be some heterogeneity. Furthermore, Pesaran (2006) stated that if heterogeneity and cross-sectional dependency exist, and their existence is ignored, substantial biases would occur, which would lead to questionable results. Similarly, Breitung (2005) suggests that if we

assume that the panel data has the property of homogeneity, then the heterogeneity among countries showing country-specific characteristics will not be caught leading to the loss of valuable economic information and ultimately questioning the overall validity of the research.

Therefore, the present research first examines the characteristics/time series properties of the panel data followed by a battery of cross-sectional dependence and slope heterogeneity tests to validate the assumption; whether the characteristics of cross-sectional dependence and slope heterogeneity exist among the different countries.

In order to analyze the causality between our variables of interest, the research adopts the Toda and Yamamoto (1995) procedure and tests for causality individually for each country due to the strong presence of heterogeneity. T-Y (1995) propose an interesting procedure extending the original Granger Causality test by the estimation of an augmented vector autoregressive model (VAR) which guarantees the asymptotic distribution of the Wald statistic (an asymptotic χ^2-distribution), since the testing procedure is robust to the integration and cointegration properties of the process, the T-Y approach seems to be appropriate.

The approach, as suggested by Toda and Yamamoto (1995) procedure has many advantages; Firstly, it can be used in a system where the variables are possibly integrated or cointegrated, without pre-testing for cointegration. Secondly, Rambaldi and Doran (1996) state that computationally the MWald test (Modified Wald Test) is accurate and robust. Thirdly, according to the Monte Carlo experiments on bivariate and trivariate models performed by Zapata and Rambaldi (1997), despite the intentional over-fitting, the MWald test performs as well as other test procedures.

The next sub-section(s) present the preliminary tests and results followed by a brief discussion on the Toda and Yamamoto (1995) procedure.

5.1 Lag Selection

Before estimating and drawing causal inferences lag selection is of utmost importance. Tests for causality are quite sensitive to the number of lags used. In general, both too few and too many lags may cause problems and leads to unstable and questionable results (Engle and Granger 1987; Gujarati, 2009; Ghysels and Marcellino, 2018). Too few lags may lead to some crucial characteristics not being captured by the model; eventually, this specification error will usually cause bias in the retained regression coefficients, leading to incorrect conclusions.

On the other hand, too many lags would waste precious data points in the time-series due to adjustments and this specification error will usually increase the standard errors of the estimated coefficients, making the results less precise and causing instability (Zivot and Wang, 2006). More often than that, using more lags does lead to significant causality; however, it also inflates the standard error leading to inaccurate results. Furthermore, in order to prevent autocorrelation, selecting the optimal number of lags is of utmost importance to develop a stable model.

Although there are specific criteria through which an optimal number of lags can be decided, it is not always prudent to decide solely based on the criteria as due consideration should also be given to the stability of the model (Gujarati, 2009; Zivot and Wang, 2006; Ghysels and Marcellino (2018)).

More often than not overstating the number of lags generally leads to a false positive, i.e., Type I error. Hence, in the spirit of the past research conducted on causality concerning economic variables, the research limits the number of lags from one to four through each country, and the optimal number of lags is selected based on the Schwarz's Bayesian Information Criterion (SBIC)[11]. The lag structure is allowed to vary across countries and

[11] To maintain consistency SBIC was utilized as the only criteria for lag selection throughout the study.

models[12]. Although, for a moderately large panel like ours, this increases the computational burden substantially, nevertheless, we choose the optimal number of lags based on the SBIC criteria and allow the lag specification(s) to vary across countries and models. In the case where model stability is compromised, we increase the lag and re-estimate the model until the model is stable. However, the minimum and the maximum number of lags, i.e., one to four are kept constant.

Furthermore, for all preliminary panel tests, i.e., unit root tests, cross-sectional dependence, and slope heterogeneity tests, the appropriate lags are determined via the SBIC. The criteria can be given as follows –

$$SBIC_k = In|W| + \frac{N^2 q}{T} In(T) \quad \textbf{(1)}$$

Where W is the estimated residual covariance matrix, N is the number of equations, q is the number of coefficients per equation and T is the sample size.

5.2 Unit Root Test(s)

In any time-series analysis, it is critical to test for unit roots or in order to avoid mis-specified or spurious regressions (Engle and Granger, 1987). In order to make sure that the present research does not produce spurious results and adheres to the T-Y (1995) methodology, the paper employs several panel unit-root tests (allowing for individual intercept and trend) including the Levin, Lin and Chu and Breitung t-stat. Furthermore, the research also employs the well-known augmented Dickey Fuller (ADF) and non-parametric Phillips-Perron test (PP) unit root tests. The study applies the test(s) as mentioned above to each of the different time-series variables in the panel. The results are presented in Table 5.1

[12] Refers to the Two Models estimated.

It can be observed from the table that LVT and LNT appear to be stationary at levels and reject the null hypothesis at the 0.01 level collectively. On the other hand, LSPI and LRGDP fail to reject the null hypothesis of unit root process at levels. Although the Breitung t-stat for LSPI is significant at the 0.05 level, the other tests overwhelmingly fail to reject the null hypothesis indicating the possible presence of unit root. It can be observed that LSPI and LRGDP appear to be stationary at the first level difference. Both time-series reject the null hypothesis of unit root at the 0.01 level.

Overall, the results suggest that LVT and LNT are $I(0)$ while, LSPI and LRGDP are integrated of the first order, i.e., $I(1)$.

Table 5.6 – Unit Root Test Results

Unit Root Test **Newey-West automatic bandwidth selection and Bartlett kernel** **Lag Criteria: SBIC** **Null: Unit root (assumes unit root process)**				
Variable - LSPI	Statistic (levels)	p-value^ (levels)	Statistic (FD)	p-value^ (FD)
Levin, Lin & Chu t	1.24879	0.8941	-28.1208***	0.0000
Breitung t-stat	-2.17061**	0.0150	-17.3655***	0.0000
ADF - Fisher Chi-square	14.5848	0.6903	293.371***	0.0000
PP - Fisher Chi-square	14.8094	0.6750	292.209***	0.0000
Variable - LRGDP				
Levin, Lin & Chu t	0.99906	0.8411	-18.2211***	0.0000
Breitung t-stat	-0.99006	0.1611	-11.5321***	0.0000
ADF - Fisher Chi-square	5.21947	0.9985	193.245***	0.0000
PP - Fisher Chi-square	3.54403	0.9999	207.528***	0.0000
Variable - LNT				

Levin, Lin & Chu t	-10.1324***	0.0000	--	--
Breitung t-stat	-1.39694*	0.0812	--	--
ADF - Fisher Chi-square	145.498***	0.0000	--	--
PP - Fisher Chi-square	237.213***	0.0000	--	--
Variable - LVT				
Levin, Lin & Chu t	-16.9002***	0.0000	--	--
Breitung t-stat	-7.81246***	0.0000	--	--
ADF - Fisher Chi-square	217.608***	0.0000	--	--
PP - Fisher Chi-square	240.351***	0.0000	--	--

^Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.
Note: ***, **, and * indicate significance at the 0.01, 0.05, 0.1 level, individually.
LSPI denotes the log of stock market price index, LRGDP denotes the log of Real GDP, LNT denotes the log of number of M&A transactions, LVT denotes the log of value of M&A transactions.

5.3 Cross-Sectional Dependence and Slope Heterogeneity Test(s)

Cross-sectional dependence is one of the most critical issues to consider (Gujarati, 2009). In the age of increasing globalization, an increasing amount of relationships and integration among different countries inevitably leads to a ripple effect, i.e., a shock occurring within one nation will also influence other countries, such as the dot com bubble of 2001-02, the great recession of 2008-09, both of which were felt around the world. Therefore, when examining causality among M&A activity, stock market price index and Real GDP in the nine countries considered in this research, it is necessary to carry out a series of cross-sectional dependency tests.

The analysis begins with the application of a battery of cross-sectional dependency tests such as those proposed by Breusch and Pagan (1980), Pesaran (2004) and Pesaran and Yamagata (2008). The implementation of the Breusch and Pagan (1980) Lagrange multiplier (*LM*) procedure requires the estimation of the following panel data model:

$$y_{it} = a_i + b_i x_{it} + \mu_{it} \qquad for\ i = 1,2..,N; t = 1,2 \ldots, T \tag{2}$$

The null and alternative hypothesis can be given as –

$$H_0 : Cov(\mu_{it}, \mu_{jt}) = 0 \; for \; all \; t \; and \; i \neq j$$

$$H_1 : Cov(\mu_{it}, \mu_{jt}) \neq 0 \; for \; at \; least \; one \; pair \; of \; i \neq j$$

The LM test statistic for cross-sectional dependence can be represented as follows:

$$LM_{BP} = T \sum_{i=1}^{N-1} \sum_{j=i+1}^{N} \widehat{p^2}_{ij} \tag{3}$$

Where $\widehat{p^2}_{ij}$ is the estimated correlation coefficient among the residuals obtained from the OLS estimation of Eq(3). Under the null hypothesis, the LM test statistic has an asymptotic chi-square distribution with N(N-1)/2° $of \; freedom$.

However, the LM test statistic is only valid in the cases where N is small and T is large. To overcome this shortcoming, Pesaran (2004) proposed a modified version of the Breusch and Pagan (1980) LM test statistic which is applicable for $T \to \infty \; and \; N \to \infty$. The modified version can be given as follows –

$$CD_{LM} = \sqrt{\frac{T}{N(N-1)}} \sum_{i=1}^{N-1} \sum_{j=i+1}^{N} \left(\widehat{p^2}_{ij}\right) \tag{4}$$

The modified version is assumed to be asymptotically normally distributed. Although the CD_{LM} can be applied when N and T are large, it may suffer from size distortions in the cases where N is large, and T is small and vice versa. To overcome the shortcoming, another Test statistic was put forth by Pesaran (2004):

$$CD = \sqrt{\frac{2T}{N(N-1)}} \sum_{i=1}^{N-1} \sum_{j=i+1}^{N} (T\widehat{p^2}_{ij} - 1) \tag{5}$$

The null hypothesis under each of the stated test statistics is that there is no cross-sectional dependence among the members of the panel.

However, Pesaran and Yamagata (2008) state that the conventional CD tests somewhat lack power in and significance. To correct this shortcoming, Pesaran and Yamagata (2008) proposed the following adjusted test:

$$LM_{Adj} = \sqrt{\frac{2}{N(N-1)}} \sum_{i=1}^{N-1} \sum_{j=i+1}^{N} (\widehat{p_{ij}}) \quad \frac{(T-k-1)\widehat{p^2}_{ij} - u_{Tij}}{v_{Tij}} \tag{6}$$

The results for each of the methods discussed above are given in Table 5.2. Each of the test statistics has been conducted on all of the variables, i.e., to investigate whether the M&A activity, economic activity, and the stock market price index in one country is linked to the other countries.

Table 5.7 – Cross Section Dependence Test Results

Cross-Section Dependence Test **Lag Criteria: SBIC** **Null hypothesis: No cross-section dependence (correlation) in residuals**				
Test	LSPI	LRGDP	LNT	LVT
Breusch-Pagan LM	1703.327***	948.9134***	67.40203***	58.5503**
Pesaran scaled LM	196.4964***	107.5879***	3.700764***	2.657578***
Bias-corrected scaled LM	196.4380***	107.5294***	3.642323***	2.599136***
Pesaran CD	41.01968***	26.19482***	3.37814***	3.94319***

Note: ***, **, and * indicate significance at the 0.01, 0.05, 0.1 level, individually.
LSPI denotes the log of stock market price index, LRGDP denotes the log of Real GDP, LNT denotes the log of number of M&A transactions, LVT denotes the log of value of M&A transactions.

The results suggest that the null hypothesis of no cross-sectional dependency is rejected at the 0.01 and 0.05 level indicating a strong presence of cross-sectional dependence. Each of the nine countries have some common economic characteristics. This suggests that, when a

specific country's stock market, economic activity or M&A activity is effected or influenced in some way, this also has an effect or influence on the other countries as well. It can be said that these influences effect the variables in the same way in other countries as well.

With reference to slope heterogeneity tests, the standard F test is the most widely used way to test the null hypothesis of slope homogeneity, the null and alternative hypothesis can be given by –

$$H_0 : b_i = b \; for \; all \; i$$

$$H_1 : b_i \neq b_j$$

Where b_i are the individual intercepts and slope coefficients.

Table 5.3 shows the results of the slope heterogeneity tests; the null hypothesis refers to the slopes of the variables being homogenous. It can be observed that the results strongly reject the null hypothesis, i.e., each country can be characterized individually.

Table 5.8 – Slope Heterogeneity Test Results

Hausman Slope Heterogeneity Test (Swamy Arora Estimator) **Lag Criteria: SBIC** **Null hypothesis: No slope heterogeneity**				
Test	LSPI	LRGDP	LNT	LVT
Hausman	16.197439***	23.529511***	69.481485***	110.397115**

Note: ***, **, and * indicate significance at the 0.01, 0.05, 0.1 level, individually.
LSPI denotes the log of stock market price index, LRGDP denotes the log of Real GDP, LNT denotes the log of number of M&A transactions, LVT denotes the log of value of M&A transactions.

Each country has its system with reference to how the stock market index, Real GDP, and M&A activities influence each other, i.e., an economic relationship between the variables in one country may not be replicated by the others. It can be said that the relationships between M&A activities, stock market index and Real GDP in these countries show some considerable differences. Hence, due to the presence of heterogeneity, it makes sense to conduct a country-by-country causality analysis rather than applying a stacked causality analysis

which assumes homogeneity and assumes that all coefficients are same across all cross-sections.

5.4 Toda and Yamamoto Granger Non-Causality Approach

Toda and Yamamoto (1995) propose an interesting yet straightforward procedure extending the original Granger Causality test by the estimation of an augmented vector autoregressive model (VAR) which guarantees the asymptotic distribution of the Wald statistic (an asymptotic χ^2-distribution), since the testing procedure is robust to the integration and cointegration properties of the process. In a country-by-country analysis, the possibility of Granger non-causality between the log of the stock market price index and the log of M&A activities can be studied using a bivariate finite-order VAR. The Bivariate Toda-Yamamoto Granger non-causality test (1995) VAR model can be set up as follows –

$$y_t = \mu_0 + \left(\sum_{i=1}^{k} \alpha_{1t} y_{t-i} + \sum_{i=k+1}^{d_{max}} \alpha_{2t} y_{t-i} \right) + \left(\sum_{i=1}^{k} \beta_{1t} x_{t-i} + \sum_{i=k+1}^{d_{max}} \beta_{2t} x_{t-i} \right) + \varepsilon_{1,t} \quad \textbf{(7)}$$

$$x_t = \emptyset_0 + \left(\sum_{i=1}^{k} \gamma_{1t} y_{t-i} + \sum_{i=k+1}^{d_{max}} \gamma_{2t} y_{t-i} \right) + \left(\sum_{i=1}^{k} \delta_{1t} x_{t-i} + \sum_{i=k+1}^{d_{max}} \delta_{2t} x_{t-i} \right) + \varepsilon_{2,t} \quad \textbf{(8)}$$

Where Y= log of Stock Market Price Index and X= log of M&A activity and d_{max} is the maximum order of integration suspected to occur in the system. There is said to be the existence of one way causality from $X\ to\ Y$ if in Eq(7) in a country if not all $\beta's$ are zero, but in Eq(8) all $\gamma's$ are zero. There is one-way Granger causality from $Y\ to\ X$ in Eq(7) if all $\beta's$ are zero but in Eq(8) not all $\gamma's$ are zero and there is two-way Granger causality between $Y\ and\ X$ if neither $\beta's$ nor $\gamma's$ are zero. Additionally, there is no significant causality if $\beta's$ nor $\gamma's$ are zero. However, according to Gujarati (2009) and, Ghysels and Marcellino

(2018) a bi-variate system may result in an omitted variable bias and eventually lead to Type I error.

Hence, this research extends the bi-variate system to a tri-variate system of equations where the tri-variate system can be given as –

$$y_t = \mu_0 + \left(\sum_{i=1}^{k} \alpha_{1t} y_{t-i} + \sum_{i=k+1}^{d_{max}} \alpha_{2t} y_{t-i} \right) + \left(\sum_{i=1}^{k} \beta_{1t} x_{t-i} + \sum_{i=k+1}^{d_{max}} \beta_{2t} x_{t-i} \right) + \left(\sum_{i=1}^{k} \partial_{1t} z_{t-i} + \sum_{i=k+1}^{d_{max}} \partial_{2t} z_{t-i} \right) + \varepsilon_{1,t} \quad \textbf{(9)}$$

$$x_t = \emptyset_0 + \left(\sum_{i=1}^{k} \gamma_{1t} y_{t-i} + \sum_{i=k+1}^{d_{max}} \gamma_{2t} y_{t-i} \right) + \left(\sum_{i=1}^{k} \delta_{1t} x_{t-i} + \sum_{i=k+1}^{d_{max}} \delta_{2t} x_{t-i} \right) + \left(\sum_{i=1}^{k} \omega_{1t} z_{t-i} + \sum_{i=k+1}^{d_{max}} \omega_{2t} z_{t-i} \right) + \varepsilon_{2,t} \quad \textbf{(10)}$$

Where Y= log of Stock Market Price Index and X= log of M&A activity and Z= log of Real GDP

Since the VAR compares the variables individually, it is not necessary to specify dependent and independent variables. All of the variables are treated as endogenous; however, the model itself cannot be used to investigate the relationship between multiple variables (Toda and Yamamoto, 1995). Therefore, a causality test is appropriate for investigating the time-series variables of interest.

The idea is simple yet elegant, Toda and Yamamoto (1995) suggest that by estimating a VAR in levels, applying the MWald Test and paying subdued attention to the integration and cointegration nature of the time series data considered, one can investigate causality in a system of equations. It can be applied even when there is no integration and/or stability and rank

conditions are not satisfied *"as long as the order of integration of the process does not exceed the true lag length of the model"* (Toda and Yamamoto, 1995; 225).

The process can be given as follows –

1. Find the integration order for each series. If the integration order is different, find the maximum d_{max}. For this research the d_{max}= 1.
2. Estimate a levels VAR model (based on OLS) regardless of the integration order that was discovered, i.e., do not convert the time series variables to first differences.
3. Define the order of the VAR model (k) from lag length taken from the SBIC criteria.
4. Test if the VAR is correctly specified and is stable. If not, modify the model until it is stable and free from autocorrelation.
5. Estimate the VAR $k + d_{max}$ model.
6. Apply Granger causality test for non-causality using pairwise equations and modified Wald test for the significance of parameters on examined equations on number of time lags $(k + d_{max})$.
7. The Rejection of the null hypothesis for each country implies a rejection of Granger non-causality, i.e., the rejection of the null hypothesis supports the presence of Granger causality.

6.0 Empirical Results

The research develops two different models for each country, where the first model investigates the causal relationship between the log of the stock market price index, log of the number of M&A transactions and log of Real GDP. The second model investigates the causal relationship between the log of the stock market price index, log of value of M&A transactions, and log of Real GDP. This would enable the research to capture the relationship with reference to the different M&A measures individually.

6.1 Model 1

Model 1 refers to the model in which we consider the following variables – log of the stock market price index (LSPI), log of the number of M&A transactions (LNT), and log of Real GDP (LRGDP).

6.1.1 Stock Price Index and Number of M&A Transactions

Table 6.1 represents the results for each country. There are a number of points worth mentioning in these results.

Table 6.9 – T-Y Results for LSPI and LNT

Toda-Yamamoto test for Granger non-causality/Block Exogeneity Wald Tests					
		$H_o = LSPI\ does\ not\ cause\ LNT$		$H_o = LNT\ does\ not\ cause\ LSPI$	
Country	Lags (k)	Statistic	p-value	Statistic	p-value
Australia	2	0.428058	0.8073	3.259064	0.196
Canada	2	1.211715	0.5456	3.734499	0.1545
France	3	11.94877***	0.0076	2.189026	0.5431
Germany	2	1.573658	0.4553	2.203191	0.3323
Italy	1	0.249408	0.6175	3.83179*	0.0503
Japan	2	1.606126	0.448	0.4757	0.7883
Switzerland	1	1.170455	0.2793	1.034847	0.3090
United Kingdom	3	0.522953	0.9138	5.531233	0.1368
United States	2	2.261168	0.3228	4.821894*	0.0897

Note: ***, **, and * indicate significance at the 0.01, 0.05, 0.1 level, individually.
LSPI denotes the log of stock market price index, LNT denotes the log of number of M&A transactions.

It can be observed that the null hypothesis of non-causality between LSPI and LNT is rejected in France, Italy, and the United States. France rejects the null hypothesis at the 0.01

level demonstrating a strong one-way causality from $LSPI \rightarrow LNT$. It can be said that there is one-way causality in France from the stock market price index to the number of M&A transactions during the period 1999-2018.

Additionally, Italy rejects the null hypothesis of non-causality at the 0.1 level and demonstrates a somewhat moderate one-way causality from the number of M&A transactions to the stock market price index. Similarly, the United States demonstrates a somewhat moderate one-way causality from the number of M&A transactions to the stock market price index, i.e., $LNT \rightarrow LSPI$.

So far, concerning the economic and financial literature discussed in this research; France, Italy and the United States seem to provide somewhat moderate evidence in favour of the behavioural school which suggests that exists a relationship between the capital markets and M&A activity where one seems to influence the other. In the case of France, it can be said that there exists a relationship between the stock market and the number of M&A transactions where the stock market leads the number of M&A transactions. On the other hand, in the case of Italy and the United States, it can be said that there exists a relationship between the stock market and the number of transactions where the number of transactions leads the stock market.

With reference to the rest of the countries, there does not seem to be a significant relationship between the stock market and the number of M&A transactions.

6.1.2 Real GDP and Number of M&A Transactions

In this sub-section, the research presents the results where Real GDP and number of M&A transactions are considered. It can be observed from the table that all countries except Australia and Switzerland fail to reject the null hypothesis of non-causality existing between Real GDP and M&A transactions. Switzerland rejects the null hypothesis of non-causality at

the 0.05 level and demonstrates a somewhat strong to moderate one-way causality from $LNT \rightarrow LRGDP$. Similarly, Australia rejects the null hypothesis of non-causality at the 0.05 level and demonstrates one-way causality from $LNT \rightarrow LRGDP$.

Table 6.10 – T-Y Results for LRGDP and LNT

Toda-Yamamoto test for Granger non-causality/Block Exogeneity Wald Tests					
		$H_o = LRGDP\ does\ not\ casue\ LNT$		$H_o = LNT\ does\ not\ cause\ LRGDP$	
Country	Lags (k)	Statistic	p-value	Statistic	p-value
Australia	2	0.514056	0.7733	7.221206**	0.0270
Canada	2	1.761488	0.4145	0.819387	0.6639
France	3	2.18626	0.5347	2.143636	0.5431
Germany	2	3.292358	0.1928	3.878874	0.1438
Italy	1	0.758549	0.3838	2.635433	0.1045
Japan	2	0.564192	0.7542	1.14134	0.5651
Switzerland	1	1.273223	0.2592	5.126045**	0.0236
United Kingdom	3	1.803797	0.6141	1.10215	0.7766
United States	2	0.905988	0.6357	0.117802	0.9428

Note: ***, **, and * indicate significance at the 0.01, 0.05, 0.1 level, individually.
LRGDP denotes the log of Real GDP, LNT denotes the log of number of M&A transactions.

Keeping in mind the neoclassical theory, the empirical evidence does not really corroborate the idea of M&A activity having a relationship with economic activity where the Real GDP leads M&A activity; it is quite the opposite. The empirical evidence suggests that the number of M&A transactions leads economic activity in two of the nine countries considered.

These findings lend support to a series of correlational studies discussed in the research. It lends support to Kummer's (2006) research focusing on M&A transactions in South America, which suggests that the number of M&A transactions correlates with the development and size of an economy measured by the GDP. The study suggests that there

exists a relationship between the number of M&A transactions and GDP, where M&A activity positively influences the development and size of an economy on an international scale. Although the present research does not really analyze whether the effect is positive or negative, nevertheless the empirical evidence, specifically with reference to Australia and Switzerland supports the above conclusion. On the other hand, Doytch & Cakan (2011) in their sectoral study of M&A transactions in OECD countries, suggest that cross-border M&A transactions lead to a slowdown in the domestic economy. Their study does not find any supporting evidence of the fact that M&A activity contributes to economic growth, the exception being the services sector. Their study suggests that M&A transactions in the services sector do, indeed seem to have a positive effect on growth. Once again, the present research does not analyze if the affect is positive or negative, or differentiate between industries, however, the empirical evidence does seem to lend support to the general conclusion suggested by Doytch & Cakan (2011), i.e., the number of M&A transactions do seem to have a relationship with economic activity where M&A activity leads economic activity.

However, this is not to say that the neoclassical school fails to provide any sort of explanation with reference to M&A activities as it also includes other considerations such as liquidity and technology changes. Furthermore, most of the neoclassical studies use M&A as endogenous and are motivated towards explaining M&A activity. They fail to explore the two-way relationship/feedback relationship, which may exist between Real GDP and M&A activity. The evidence analyzed in this research simply suggests that there may be an alternative relationship existing in Australia and Switzerland where M&A activity leads economic activity.

6.2 Model 2

Model 2 refers to the model in which the research considers the following variables – log of the stock market price index (SPI), log of value of M&A transactions (LVT) and log of Real GDP (LRGDP).

6.2.1 Stock Market Price Index and Value of M&A Transactions

There are a number of points worth mentioning here. It can be observed from Table 6.3 that Australia, Canada, France, Switzerland, and the United States reject the null hypothesis of non-causality at the 0.05 level and 0.01 level individually.

Australia rejects the null hypothesis of non-causality at the 0.05 and demonstrates a strong to moderate one-way causality from the value of M&A transactions to the stock market price index, i.e., $LVT \rightarrow LSPI$. It can be said that there exists a relationship where the value of M&A transactions leads the stock market in Australia. On the other hand, Canada rejects the null hypothesis of non-causality at the 0.05 level and demonstrates a strong to moderate one-way causality from the stock market to the value of transactions, i.e., $LSPI \rightarrow LVT$. It can be said that there exists a relationship where the stock market price index leads the total value of M&A transactions in Canada.

Table 6.11 – T-Y Results for LSPI and LVT

Toda-Yamamoto test for Granger non-causality/Block Exogeneity Wald Tests					
		$H_o = LSPI\ does\ not\ cause\ LVT$		$H_o = LVT\ does\ not\ cause\ LSPI$	
Country	Lags (k)	Statistic	p-value	Statistic	p-value
Australia	3	4.371032	0.2241	7.926319**	0.0476
Canada	2	8.629783**	0.0134	2.385904	0.3033
France	3	15.79686***	0.0012	11.50551***	0.0093
Germany	2	4.492416	0.1058	2.320339	0.3134
Italy	1	0.227506	0.6334	1.178281	0.2777
Japan	2	2.091189	0.3515	1.901341	0.3865
Switzerland	1	5.110248**	0.0238	0.690162	0.4061
United Kingdom	2	0.324697	0.8501	2.981004	0.2253
United States	2	7.383725**	0.0249	1.428505	0.4896

Note: ***, **, and * indicate significance at the 0.01, 0.05, 0.1 level, individually.
LSPI denotes the log of stock market price index, LVT denotes the log of value of M&A transactions.

Interestingly enough, France rejects the null hypothesis of no-causality at the 0.01 level, demonstrating an extremely significant bi-directional causality from the stock market to the value of transactions and vice-versa, i.e., $LSPI \leftrightarrow LVT$. It can be said that there exists a relationship where the stock market and the value of transactions mutually Granger cause each other in France.

Looking at Switzerland, it rejects the null hypothesis of non-causality at the 0.05 level and demonstrates a strong to moderate one-way causality from the stock market price index to the value of M&A transactions, i.e., $LSPI \rightarrow LVT$. Similarly, the United States rejects the null hypothesis of non-causality at the 0.05 level and demonstrates a strong to moderate one-way causality from the stock market price index to the value of M&A transactions, i.e., $LSPI \rightarrow LVT$.

With reference to the results discussed above, France exhibits strong evidence in support of the behavioural school of thought, which emphasizes a relationship between the stock market and M&A activity where one seems to influence the other. It is worth mentioning that in the case of France, both characteristics of M&A activity, i.e., number and value of M&A transactions seem to lead the stock market. Furthermore, the relationship between the value of M&A transactions and the stock market is a two-way street, i.e., $LSPI \leftrightarrow LVT$.

When looking at the results of Table 6.1 and Table 6.3, it is interesting to see how the different characteristics of M&A activity are related to the stock market. On the one hand it is observed, France demonstrates a bi-directional causality when considering the value of M&A transactions, on the other hand when considering the number of transactions it displays a one-way causal relationship from $LSPI \rightarrow LNT$. Similarly, when considering the number of transactions in the United States there seems to be a one-way causality between the number of M&A transactions and the stock market, i.e., $LNT \rightarrow LSPI$. However, when considering the value of M&A transactions, the United States seems to demonstrate one way causality from the stock market to the value of transactions i.e., $LSPI \rightarrow LVT$. Hence, it can be said that different characteristics of M&A transactions carry different economic information and when talking about aggregate M&A activity it is imperative to look at the number and the value of M&A deals in order to understand the economic significance of M&A transactions.

6.2.2 Real GDP and Value of M&A Transactions

When considering Real GDP and the total value of M&A transactions, it can be observed from Table 6.4 that, except Switzerland, every other country fails to reject the null hypothesis of non-causality between Real GDP and value of M&A transactions.

Switzerland rejects the null hypothesis at the 0.05 level, demonstrating a strong to moderate one-way causality from $LVT \rightarrow LRGDP$. It can be said there exists a relationship between Real GDP and the value of M&A transactions where the total value of M&A transactions lead Real GDP.

Table 6.12 – T-Y Results for LRGDP and LVT

Toda-Yamamoto test for Granger non-causality/Block Exogeneity Wald Tests					
		$H_o = LRGDP\ does\ not\ cause\ LVT$		$H_o = LVT\ does\ not\ cause\ LRGDP$	
Country	Lags (k)	Statistic	p-value	Statistic	p-value
Australia	3	4.394131	0.2219	3.143371	0.3700
Canada	2	3.416587	0.1812	0.168879	0.919
France	3	0.919146	0.8208	0.6505	0.8848
Germany	2	0.920574	0.6311	3.900427	0.1422
Italy	1	0.196845	0.6573	0.929931	0.3349
Japan	2	3.869819	0.1444	1.456127	0.4828
Switzerland	1	2.032369	0.1540	5.780481**	0.0162
United Kingdom	2	0.235279	0.8890	2.620671	0.2697
United States	2	0.201668	0.9041	0.556467	0.7571

Note: ***, **, and * indicate significance at the 0.01, 0.05, 0.1 level, individually.
LRGDP denotes the log of Real GDP, LVT denotes the log of value of M&A transactions.

Keeping in mind the results we obtained in Table 6.2, there seems to be a relationship between Real GDP and aggregate M&A transactions where the aggregate level, i.e., number and value of M&A transactions leads Real GDP in Switzerland. These findings lend support to a series of correlational studies as discussed in the literature review and Section 6.1.2

Furthermore, as mentioned before the majority of the studies with reference to the neoclassical school of thought take M&A transactions to be endogenous and fail to study the two-way relationship between M&A transactions and economic activity. The findings above

can be considered as a contribution to the neoclassical school of thought wherein, the two-way relationship between aggregate M&A transactions and economic activity has been considered. The findings suggest that there may exist a relationship between M&A transactions and Real GDP, where M&A transactions lead Real GDP, specifically in the case of Switzerland and Australia (Table 6.2).

7.0 Secondary Analysis and Robustness Check

In this section, we discuss the results of our secondary analysis, i.e., we study the causality between the stock market price index and Real GDP in both of the models developed. Furthermore, in order to check the validity of our developed model(s), we also do a battery of post-estimation tests as suggested by T-Y (1995) which include checking for model stability and autocorrelation.

The results, as obtained, are presented in Table 7.1 Column(s) 2-5 represent the results for Model 1, where we consider the number of M&A transactions in the tri-variate model, while column(s) 6-9 represent the results for Model 2, where we consider the value of M&A transactions.

Table 7.13 – T-Y Results for LRGDP and LSPI

Toda-Yamamoto test for Granger non-causality/Block Exogeneity Wald Tests								
$H_{o(NT)} = LSPI\ does\ not\ cause\ LRGDP$			$H_{o(NT)} = LRGDP\ does\ not\ cause\ LSPI$		$H_{o(VT)} = LSPI\ does\ not\ cause\ LRGDP$		$H_{o(VT)} = LRGDP\ does\ not\ cause\ LSPI$	
Country	Statistic	p-value	Statistic	p-value	Statistic	p-value	Statistic	p-value
Australia	2.456601	0.2928	10.69911***	0.0048	3.254708	0.354	13.52077***	0.0036
Canada	2.43187	0.2964	8.977979**	0.0112	1.784297	0.4098	9.671977***	0.0079
France	0.606856	0.8949	8.845311**	0.0314	0.403262	0.9396	12.11368***	0.007
Germany	3.185588	0.2034	3.507385	0.1731	2.634023	0.2679	2.124992	0.3456
Italy	0.002176	0.9628	0.179143	0.6721	0.001598	0.9681	0.413385	0.5203

Japan	4.316382	0.1155	11.2976***	0.0035	2.551333	0.2792	13.61075***	0.0011
Switzerland	1.204028	0.2725	0.010472	0.9185	0.143033	0.7053	0.044762	0.8324
United Kingdom	1.694535	0.4286	5.982733*	0.0502	1.718376	0.4235	7.466614**	0.0239
United States	2.061693	0.3567	33.79963***	0.0000	1.738768	0.4192	36.57423***	0.0000

Note: ***, **, and * indicate significance at the 0.01, 0.05, 0.1 level, individually.
LSPI denote the log of stock market price index, LRGDP denotes the log of Real GDP.

It can be observed that both models provide the same conclusion, i.e., the null hypothesis of non-causality is rejected in all countries except Germany, Italy, and Switzerland. The rest of the countries demonstrate a strong to moderate one-way causality from Real GDP to the stock market price index. In the case of these six countries, it can be said that there exists a relationship between Real GDP and the stock market price index where Real GDP leads the stock market price index, i.e., $LRGDP \rightarrow LSPI$.

These findings lend support to a series of studies conducted by Chen, Roll and Ross, (1986) and Geske and Roll (1983). The findings suggest that the stock market can be considered as responding to external forces such as Real GDP; furthermore, it can also be said that it has a feedback on other variables such as the total value of transactions as discussed in Section 6.2.1. It also lends support to previous literature conducted on studying the relationship between Real GDP and stock market (Balvers, Cosimano, & Mcdonald, 1990; Bernanke & Kuttner, 2005; Campbell, 1987; Chen et al., 1986; Gupta & Modise, 2013; Mookerjee & Yu, 1997).

However, the present research is different from studies mentioned above as this research considers the two-way relationship between each of the variables and discovers a feedback relationship where various characteristics of M&A lead the stock market and, in some cases, Real GDP. On the other hand, in some cases, the stock market is seen to lead M&A activity, and in a majority of the countries, Real GDP leads the capital markets.

To check for the validity of our findings, we perform some model diagnostics which enables the research to render its findings economically valid. First, we check for model stability and autocorrelation using the inverse roots test (Lutkepohl, 2005) and LM tests. The inverse roots test suggests that if all roots have modulus less than one and lie inside the unit circle, the model satisfies the stability condition and the inferences so made can be considered as economically valid. Furthermore, the LM tests for serial correlation tests the null hypothesis of no serial correlation at the selected number of lags (k).

The results for model stability and LM tests for both of the models; country-by-country are reported in the appendix (Exhibit A); the results suggest that serial correlation does not pose a threat to our model(s); hence, the models developed in this research are free from serial correlation. Furthermore, the models developed also satisfy the stability condition.

8.0 Remarks and Limitations

It is worth mentioning that it is easy for researchers to fall into the "post hoc ergo propter hoc trap" in causal research. However, this research avoids this disadvantage as it does not aim to prove causality in the absolute sense, i.e., it does not aim to prove if $y\ follows\ \chi$*; therefore,* χ *must be a cause of* y. Time series analysts look at this from the perspective of a unique unidirectional property – cause precedes effect. Granger (1969) introduced a measure called "Granger Causality Test." Fundamentally, the Granger Test states that "cause cannot come after effect" – χ *is a cause of y if it is useful in forecasting y.* To define useful - χ *can increase the accuracy of the prediction of y, considering only past values of y.* The use of the Granger test allows the research to draw conclusions concerning aggregate M&A activity and the stock market. According to Zikmund, Babin, Carr, & Griffin (2012), a causal inference will only be supported if all three critical criteria of causal evidence are met–

1. Temporal Sequence
2. Concomitant Variation
3. Nonspurious Association

According to Zikmund, Babin, Carr, & Griffin (2012: 57), absolute or true causality can only be confirmed if *"the cause is necessary and sufficient to bring about the effect."* However, the Granger Test, as a measure, does not imply true causality. It only identifies if one variable precedes another and can be used as a predictor of the other, i.e., *χ occurs before y and x can be used as a predictor of y*. Orcutt (1952) states, the implications of any relationship are dependent on whether it holds in one or more directions. If there is indeed an association between the variables then the variable which lags in time - *"as in a causal chain leading from the variable which precedes in time, but not vice-versa"*, implies that actions taken in the present do not modify the past (Orcutt, 1952: 311). According to Orcutt (1952), the above statement will also hold true of actions in the future. Furthermore, Guilkey & Salemi (1982) suggest that the Granger Test is the most feasible computational analysis for practitioners to conduct causality tests as it can help in avoiding spurious relations and can assist in testing the general validity of Granger cause, i.e., *χ occurs before y and x can be used as a predictor of y.*

Hence, the specified econometric approach is adopted as the aim is not to perfectly predict future stock market returns, M&A activity or economic activity in terms of modeling, but rather to determine the usefulness of the specific variables utilized in the study to explain the relationship between the variables of interest. Furthermore, according to Rambaldi and Doran (1996) the modified version as suggested by T-Y (1995) performs consistently well over a wide range of systems including near-integrated, stationary and mixed integrated and stationary systems; cases for which the pretesting approaches tend to over-detect causality and eventually lead to spurious results

Although, the empirical evidence corroborates the argument made by the behavioural school of thought, i.e., a relationship exists between the stock market and M&A activity where the stock market leads M&A activity in most cases and in some M&A activity leads the stock market, it should be noted that the research does not invalidate the neoclassical school of thought. If anything, it contributes to the neoclassical school of thought by studying the two-way relationship between M&A transactions and GDP. The neoclassical approach argues that economic and industry conditions play a vital role in explaining M&A transactions, however, the relationship as mentioned in the previous literature seems to be reversed in the present research, i.e., there seems to exist a relationship between M&A activity and economic condition where M&A activity (both frequency and value) lead Real GDP in the case of Australia and Switzerland.

Additionally, it should be noted that due to the limited scope of the research and data constraints, the research only incorporates Real GDP as a measure for studying the relationship as suggested by the neoclassical school. It is quite possible that other appropriate measures, such as industry shocks or liquidity, may have a significant role to play in explaining M&A activity and vice-versa.

One major limitation of this research is the methodology utilized. Although the approach used in this work can examine the causal relationships among M&A activities, stock market price index and economic activity in a country-by-country analysis, it cannot clearly examine whether the relationship is positive or negative; additionally, the correlation between the residuals of different countries have not been taken consideration. It is also worth mentioning that this study does not classify the M&A activity in detail, such as the method of takeover and payment.

9.0 Conclusion

This research investigates the presence of Granger causality between economic activity, aggregate M&A activity, and investors' behaviour in nine countries using quarterly data from 1999-2018. In the present research, economic activity is measured by Real GDP, investors' behaviour is measured by the stock market price index and M&A activity is measured by two indicators; the value of M&A transactions and number of M&A transactions.

The research first examines the characteristics/time-series nature of the data to identify the best-suited econometric approach. According to the various cross-sectional dependence tests and slope heterogeneity tests conducted in the present research, it can be concluded that each of the nine countries have some common economic characteristics. When a specific country's stock market, economic activity, or M&A activity is affected or influenced in some way, this also has an effect or influence on the other countries as well. It can also be said that these influences affect the variables in the same way in other countries as well. Furthermore, the research suggests that each country has its system with reference to how stock market index, Real GDP, and M&A activities influence each other and operate individually, i.e., an economic relationship between the variables in one country may not be replicated by the others. The relationships between M&A activities, stock market index, and Real GDP in these countries show some considerable differences and hence, a country-by-country analysis makes sense.

The research finds considerable evidence in support of the behavioural school of thought where the stock market and M&A activity seem to influence each other. Out of the nine countries investigated, six countries show strong to moderate causality between M&A activity (number or value) and stock market price index. France rejects the null hypothesis of non-causalitydemonstrating a strong one-way causality from $LSPI \rightarrow LNT$. Additionally, Italy rejects the null hypothesis of non-causalityand demonstrates a somewhat moderate one

way causality from the number of M&A transactions to the stock market price index. Similarly, the United States demonstrates a somewhat moderate one-way causality from the number of M&A transactions to the stock market price index, i.e., $LNT \rightarrow LSPI$. On the other hand, when the research considers the value of M&A transactions and the stock market price index, Australia rejects the null hypothesis of non-causalityand demonstrates a strong to moderate one-way causality from the value of M&A transactions to the stock market price index, i.e., $LVT \rightarrow LSPI$. On the other hand, Canada rejects the null hypothesis of non-causalityand demonstrates a strong to moderate one-way causality from the stock market to the value of transactions, i.e., $LSPI \rightarrow LVT$.

Interestingly enough, France rejects the null hypothesis of non-causalityand demonstrates an extremely significant bi-directional causality from the stock market to the value of transactions and vice-versa, i.e., $LSPI \leftrightarrow LVT$. It can be said that there exists a relationship where the stock market and the value of transactions mutually cause each other in France. Switzerland rejects the null hypothesis of non-causalityand demonstrates a strong to moderate one-way causality from the stock market price index to the value of M&A transactions, i.e., $LSPI \rightarrow LVT$. Similarly, the United States rejects the null hypothesis of non-causalityand demonstrates a strong to moderate one-way causality from the stock market price index to the value of M&A transactions, i.e., $LSPI \rightarrow LVT$.

With reference to the neoclassical school of thought, this research does not find any evidence of a relationship between economic activity and M&A activity where Real GDP leads M&A activity (both number and value). On the contrary, there seems to exist a relationship between M&A activity and economic condition where M&A activity (both frequency and value) leads Real GDP in the case of Australia and Switzerland.

Furthermore, according to the secondary analysis between Real GDP and stock market price index, this research suggests that the stock market can be considered as

responding to external forces; additionally, it can also be said that it has feedback on other variables such as M&A activity. It also lends support to previous literature conducted on studying the relationship between Real GDP and the stock market.

These results have some important implications for investors and policymakers. The results presented in this research suggest that there seems to be a relationship between how investors behave (measured by the capital markets) and M&A transactions where investors behaviour and M&A activity influence each other. In some cases, M&A transactions lead the capital markets, and in others, the capital markets lead M&A transactions. Specifically, in Italy and the United States, deal-making activity in terms of the number of deals seems to have important implications for the way investors behave. On the other hand, in France investors behaviour may have important implications for deal-making activity in terms of the number of deals. Similarly, when considering the value of transactions in France, there seems to be the presence of bi-directional causality between the capital markets and the total value of deals. Additionally, it can be said that the way investors behave has important implications for the value and number of deals being made in France; furthermore, the aggregate value of deals may have important implications for the reaction developed by investors. Similarly, in Canada, Switzerland, and the United States, investors' behaviour seems to impact deal making activity in terms of the total value of deals. On the other hand, in Australia, deal-making activity in terms of the total value of transactions may have important implications for the reaction the investors develop.

With reference to policymakers, transactions such as M&A's seem to have important implications for the overall economy in Australia in Switzerland. Policymakers should keep a close watch on deal-making activities as this may have important implications on how the economy reacts. Furthermore, economic activity also seems to have an impact on how

investors behave in Australia, Canada, France, Japan, the United Kingdom, and the United States. Investors seem to develop a reaction based on the condition of the overall economy.

An exciting direction for future research would be to differentiate between positive and negative reactions and also differentiate between the different methods of payment, internal and domestic transactions, and deal types.

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Exhibit A: Model Diagnostics

Australia (NT)

Roots of Characteristic Polynomial	
Root	Modulus
0.963112	0.963112
0.886887	0.886887
0.669061	0.669061
-0.411475	0.411475
0.248824 - 0.158480i	0.295008
0.248824 + 0.158480i	0.295008
No root lies outside the unit circle.	
VAR satisfies the stability condition.	

VAR Residual Serial Correlation LM Tests				
Null hypothesis: No serial correlation at lag h				
Lag	LRE* stat	Prob.	Rao F-stat	Prob.
1	25.48600	0.0025	2.988317	0.0025
2	9.422957	0.3992	1.054223	0.3993

Australia (VT)

Roots of Characteristic Polynomial	
Endogenous variables: SPI RGDP VT	
Exogenous variables: C	
Lag specification: 1 3	
Date: 07/22/19 Time: 19:35	
Root	Modulus
0.972891	0.972891
0.884443	0.884443
0.604510 - 0.212698i	0.640838
0.604510 + 0.212698i	0.640838
-0.603289	0.603289
-0.185905 - 0.461540i	0.497574
-0.185905 + 0.461540i	0.497574
0.227708 - 0.326542i	0.398096
0.227708 + 0.326542i	0.398096
No root lies outside the unit circle.	
VAR satisfies the stability condition.	

VAR Residual Serial Correlation LM Tests				
Null hypothesis: No serial correlation at lag h				
Lag	LRE* stat	Prob.	Rao F-stat	Prob.
1	24.48858	0.0036	2.862952	0.0036
2	16.65531	0.0544	1.902986	0.0545
3	12.05491	0.2102	1.359025	0.2104

Canada(NT)

Roots of Characteristic Polynomial	
Root	Modulus
0.944793	0.944793
0.916527	0.916527
0.579871	0.579871
-0.539241	0.539241
0.327253	0.327253
0.210443	0.210443
No root lies outside the unit circle.	
VAR satisfies the stability condition.	

VAR Residual Serial Correlation LM Tests				
Null hypothesis: No serial correlation at lag h				
Lag	LRE* stat	Prob.	Rao F-stat	Prob.
1	26.38127	0.0018	3.101456	0.0018
2	10.46620	0.3141	1.174487	0.3142

Canada(VT)

Roots of Characteristic Polynomial	
Root	Modulus
0.944189	0.944189
0.899938	0.899938
-0.416658	0.416658
0.090104 - 0.301245i	0.314431
0.090104 + 0.301245i	0.314431
0.304266	0.304266
No root lies outside the unit circle.	
VAR satisfies the stability condition.	

VAR Residual Serial Correlation LM Tests				
Null hypothesis: No serial correlation at lag h				
Lag	LRE* stat	Prob.	Rao F-stat	Prob.
1	17.14269	0.0465	1.961462	0.0466
2	9.181572	0.4207	1.026498	0.4208

France(NT)

Roots of Characteristic Polynomial	
Root	Modulus
0.961309	0.961309
0.795772 - 0.166699i	0.813044
0.795772 + 0.166699i	0.813044
-0.536871	0.536871
-0.135015 - 0.500474i	0.518365
-0.135015 + 0.500474i	0.518365
0.410985	0.410985
0.086884 - 0.205088i	0.222733
0.086884 + 0.205088i	0.222733
No root lies outside the unit circle.	
VAR satisfies the stability condition.	

VAR Residual Serial Correlation LM Tests				
Null hypothesis: No serial correlation at lag h				
Lag	LRE* stat	Prob.	Rao F-stat	Prob.
1	20.01470	0.0178	2.360463	0.0179
2	15.65843	0.0744	1.809776	0.0746
3	9.120440	0.4262	1.022898	0.4266

France(VT)

Roots of Characteristic Polynomial	
Root	Modulus
0.953677	0.953677
0.852879 - 0.213574i	0.879214
0.852879 + 0.213574i	0.879214
-0.141970 - 0.569682i	0.587105
-0.141970 + 0.569682i	0.587105
-0.416313 - 0.266264i	0.494179
-0.416313 + 0.266264i	0.494179
0.236939 - 0.252775i	0.346461
0.236939 + 0.252775i	0.346461
No root lies outside the unit circle.	
VAR satisfies the stability condition.	

VAR Residual Serial Correlation LM Tests				
Null hypothesis: No serial correlation at lag h				
Lag	LRE* stat	Prob.	Rao F-stat	Prob.
1	20.01470	0.0178	2.360463	0.0179
2	15.65843	0.0744	1.809776	0.0746
3	9.120440	0.4262	1.022898	0.4266

Germany(NT)

Roots of Characteristic Polynomial	
Root	Modulus
0.998407	0.998407
0.918225	0.918225
0.383220 - 0.256581i	0.461185
0.383220 + 0.256581i	0.461185
-0.415926	0.415926
0.206788	0.206788
No root lies outside the unit circle.	
VAR satisfies the stability condition.	

VAR Residual Serial Correlation LM Tests				
Null hypothesis: No serial correlation at lag h				
Lag	LRE* stat	Prob.	Rao F-stat	Prob.
1	21.35521	0.0112	2.501636	0.0112
2	6.125809	0.7273	0.678318	0.7274

Germany(VT)

Roots of Characteristic Polynomial	
Root	Modulus
0.996122	0.996122
0.895340	0.895340
0.279830 - 0.248140i	0.374003
0.279830 + 0.248140i	0.374003
0.211366	0.211366
-0.146127	0.146127
No root lies outside the unit circle.	
VAR satisfies the stability condition.	

VAR Residual Serial Correlation LM Tests				
Null hypothesis: No serial correlation at lag h				
Lag	LRE* stat	Prob.	Rao F-stat	Prob.
1	25.20362	0.0028	2.995242	0.0028
2	3.468775	0.9428	0.380387	0.9428

Italy(NT)

Roots of Characteristic Polynomial	
Root	Modulus
0.976417	0.976417
0.931585	0.931585
-0.213285	0.213285
No root lies outside the unit circle.	
VAR satisfies the stability condition.	

VAR Residual Serial Correlation LM Tests				
Null hypothesis: No serial correlation at lag h				
Lag	LRE* stat	Prob.	Rao F-stat	Prob.
1	14.20063	0.1154	1.631480	0.1157

Italy(VT)

Roots of Characteristic Polynomial	
Root	Modulus
0.971043	0.971043
0.927494	0.927494
-0.084508	0.084508
No root lies outside the unit circle.	
VAR satisfies the stability condition.	

VAR Residual Serial Correlation LM Tests				
Date: 07/22/19 Time: 18:06				
Sample: 1999Q1 2018Q4				
Included observations: 52				
Null hypothesis: No serial correlation at lag h				
Lag	LRE* stat	Prob.	Rao F-stat	Prob.
1	13.66293	0.1348	1.565730	0.1352

Japan (NT)

Roots of Characteristic Polynomial	
Root	Modulus
0.946668 - 0.060905i	0.948625
0.946668 + 0.060905i	0.948625
0.591607	0.591607
-0.468396	0.468396
0.207502 - 0.331068i	0.390721
0.207502 + 0.331068i	0.390721
No root lies outside the unit circle.	
VAR satisfies the stability condition.	

VAR Residual Serial Correlation LM Tests				
Date: 07/22/19 Time: 18:07				
Sample: 1999Q1 2018Q4				
Included observations: 79				
Null hypothesis: No serial correlation at lag h				
Lag	LRE* stat	Prob.	Rao F-stat	Prob.
1	25.72732	0.0023	3.018757	0.0023
2	8.433008	0.4912	0.940766	0.4913

Japan (VT)

Roots of Characteristic Polynomial	
Root	Modulus
0.944999 - 0.048828i	0.946260
0.944999 + 0.048828i	0.946260
-0.502429	0.502429
0.486323	0.486323
0.214596 - 0.384024i	0.439916
0.214596 + 0.384024i	0.439916
No root lies outside the unit circle.	
VAR satisfies the stability condition.	

VAR Residual Serial Correlation LM Tests				
Null hypothesis: No serial correlation at lag h				
Lag	LRE* stat	Prob.	Rao F-stat	Prob.
1	28.32083	0.0008	3.348571	0.0008
2	11.44102	0.2467	1.287518	0.2468

Switzerland (NT)

Roots of Characteristic Polynomial	
Root	Modulus
0.956857 - 0.006154i	0.956877
0.956857 + 0.006154i	0.956877
-0.012640	0.012640
No root lies outside the unit circle.	
VAR satisfies the stability condition.	

VAR Residual Serial Correlation LM Tests				
Date: 07/22/19 Time: 18:15				
Sample: 1999Q1 2018Q4				
Included observations: 51				
Null hypothesis: No serial correlation at lag h				
Lag	LRE* stat	Prob.	Rao F-stat	Prob.
1	4.033460	0.9092	0.441707	0.9093

Switzerland (VT)

Roots of Characteristic Polynomial	
Root	Modulus
0.969495	0.969495
0.936819	0.936819
-0.073189	0.073189
No root lies outside the unit circle.	
VAR satisfies the stability condition.	

VAR Residual Serial Correlation LM Tests				
Null hypothesis: No serial correlation at lag h				
Lag	LRE* stat	Prob.	Rao F-stat	Prob.
1	12.46845	0.1882	1.421657	0.1886

United Kingdom (NT)

Roots of Characteristic Polynomial	
Root	Modulus
0.931729	0.931729
0.885158 - 0.072152i	0.888094
0.885158 + 0.072152i	0.888094
0.194427 - 0.563524i	0.596122
0.194427 + 0.563524i	0.596122
0.358357	0.358357
-0.339464	0.339464
-0.248595 - 0.205310i	0.322416
-0.248595 + 0.205310i	0.322416
No root lies outside the unit circle.	
VAR satisfies the stability condition.	

VAR Residual Serial Correlation LM Tests				
Null hypothesis: No serial correlation at lag h				
Lag	LRE* stat	Prob.	Rao F-stat	Prob.
1	17.87112	0.0367	2.058551	0.0368
2	23.23837	0.0057	2.725525	0.0057
3	6.089832	0.7309	0.674490	0.7310

United Kingdom (VT)

Roots of Characteristic Polynomial	
Root	Modulus
0.919480	0.919480
0.826296	0.826296
0.572700 - 0.140331i	0.589642
0.572700 + 0.140331i	0.589642
-0.424827	0.424827
-0.058401	0.058401
No root lies outside the unit circle.	
VAR satisfies the stability condition.	

VAR Residual Serial Correlation LM Tests				
Null hypothesis: No serial correlation at lag h				
Lag	LRE* stat	Prob.	Rao F-stat	Prob.
1	27.76577	0.0010	3.289523	0.0010
2	13.26667	0.1509	1.502522	0.1511

United States(NT)

Roots of Characteristic Polynomial	
Root	Modulus
0.990866	0.990866
0.868626	0.868626
0.662368	0.662368
-0.461112	0.461112
0.456084	0.456084
-0.299561	0.299561
No root lies outside the unit circle.	
VAR satisfies the stability condition.	

VAR Residual Serial Correlation LM Tests				
Null hypothesis: No serial correlation at lag h				
Lag	LRE* stat	Prob.	Rao F-stat	Prob.
1	10.53057	0.3093	1.182634	0.3094
2	6.941676	0.6432	0.771040	0.6433

United States(VT)

Roots of Characteristic Polynomial	
Root	Modulus
0.989647	0.989647
0.852594	0.852594
0.682962	0.682962
0.367391	0.367391
-0.293634 - 0.124289i	0.318856
-0.293634 + 0.124289i	0.318856
No root lies outside the unit circle.	
VAR satisfies the stability condition.	

VAR Residual Serial Correlation LM Tests						
Null hypothesis: No serial correlation at lag h						
Lag	LRE* stat	df	Prob.	Rao F-stat	df	Prob.
1	7.543044	9	0.5808	0.839383	(9, 160.8)	0.5809
2	4.603441	9	0.8674	0.507676	(9, 160.8)	0.8675